

Chapter 21

Design and Testing of a 60 kW Yo-Yo Airborne Wind Energy Generator

Mario Milanese, Franco Taddei, Stefano Milanese

Abstract

The advances in the design and testing of a 60 kW Yo-Yo AWE generator are presented. The generator uses power kites, linked to the ground by two tethers, reeled on two drums that are connected to two electric drives. The flight of the wings is tracked using on-board wireless instrumentation and it is suitably driven by a ground control unit, through differentially pulling of the tethers. Electricity is generated at ground level obtained by continuously performing a two-phase cycle: a traction one, where the kite unreel the tethers, inducing energy generation through rotation of electric drives. When the maximum tether length is reached, the drives act as motors, to reel back the tethers to start another traction phase. The main components (electro-mechanical structure, sensors and data communication, Energy management system, hardware and software for real-time control) are described.

Results are presented from some of tests until now performed and the experimental energy and power values are compared with the theoretical optimal value based on the simplified analysis in Loyd's seminal paper as well with computer simulations based on the model and control strategy developed by Kitenergy research group.

Mario Milanese
Kitenergy, Via Livorno 60, 10144 Torino, Italy, e-mail: mario.milanese@kitenergy.net
Franco Taddei
Kitenergy, Via Livorno 60, 10144 Torino, Italy, e-mail: taddei@cesi.net
Stefano Milanese
Kitenergy, Via Livorno 60, 10144 Torino, Italy, e-mail: stefano.milanese@kitenergy.net